

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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For : RUBBER COMPOSITION FOR TIRE AND TIRE MADE THEREFROM

Art Unit & Examiner : 1796, Ms. Alicia M. Toscano

DECLARATION UNDER 37 CFR 1.132

ASSISTANT COMMISSIONER FOR PATENTS

WASHINGTON, D.C. 20231

Sir:

I, Seiichi KATO, in care of 3-1-1, Ogawahigashi-cho Kodaira-shi, Tokyo, Japan, declare that:

1. I graduated from The University of Tokyo and received my master's degree in graduate school of Science specialized in chemistry in March 2002, and joined BRIDGESTONE CORPORATION in April 2002. Then, I have been engaged in the research and development of ingredients for rubber compositions in Material-Development Department up to the present.

2. I am familiar with the subject matter disclosed in the present U.S. Patent Application as identified above and the following experiments were carried out by me.

3. Experiment

The Examiner states "Regarding Tables 1 and 2, the data is not sufficient to

show unexpected results for the inclusion of a tackifier because there is no comparative example of just Resin A and Resin B."

Accordingly, Comparative Examples A to J which contain no Aromatic oil were conducted. Comparative Examples A and B contain just (A) copolymer and (B) copolymer but not Aromatic oil. Comparative C to J contains just (A) copolymer, (B) copolymer and a Resin disclosed in Nakamura (US6414078) or Sasaka (US6186204) but not Aromatic oil.

Procedure and Test Methods of the Experiment

The rubber compositions of Comparative Examples A to J are prepared in the procedure shown in the specification. The test method for hysteresis loss, dry gripping property and wet gripping property and processability in production plants are also shown in the specification.

The Formulation 1 was used for the preparations of the rubber compositions of Comparative Examples B to J.

Table 3 in the specification

Mixing stage	Components of mixing	Formulation 1
First stage	SER# 1500	—
	styrene-butadiene copolymer rubber (a)	100
	hydrogenated styrene-butadiene copolymer rubber (b)	80
	aromatic oil	—
	SAF carbon black	80
	zinc oxide	1.5
	stearic acid	2
	antioxidant 6C ^{*20}	1.5
	paraffin wax	1.5
	resin (shown in Tables 4, 7 and 8)	40
Second stage	zinc oxide	1.5
	vulcanization accelerator DM ^{*22}	1.5
	vulcanization accelerator CZ ^{*24}	2.5
	sulfur	1.5

[Note]

*20: N-1,3-Dimethylbutyl-N'-phenyl-p-phenylenediamine.

*22: Dibenzothiazyl disulfide.

*24: N-Cyclohexyl-2-benzothiazolylsulfenamide.

The resins used in the rubber compositions of Comparative Examples C to J are as follows:

Resins disclosed in Nakamura (US6414073)		
Comparative Example C	a	terpene phenol resin "YS Polystar T115" manufactured by YASUHARA CHEMICAL CO., LTD.
Comparative Example D	b	terpene resin "YS Resin Pxl250" manufactured by YASUHARA CHEMICAL CO., LTD.
Comparative Example E	c	terpene resin "YS Resin Pxl150" manufactured by YASUHARA CHEMICAL CO., LTD.
Comparative Example F	d	maleic anhydride-modified C5 resin "Quintone C200L" manufactured by NIPPON ZEON CO., LTD.
Comparative Example G	e	maleic anhydride-modified C5, C9 resin "Quintone D200" manufactured by NIPPON ZEON CO., LTD.
Comparative Example H	f	aliphatic-based hydrocarbon resin "HILETS R500" manufactured by MITSUI CHEMICAL CO. LTD.,

Resins disclosed in Sasaka (US6186204)		
Comparative Example I	m	dicyclopentadiene resin "ESCOREZ 8180" manufactured by EXXON Company
Comparative Example J	n	aromatic hydrocarbon resin "NISSEKI NEOPOLYMER 80" manufactured by NIPPON OIL Co., Ltd.

Result

The results obtained are shown in the following Tables.

The data of Comparative Example A is shown with those of Examples 1 to 9 and Comparative Examples 1 and 2. The data of Comparative Examples B to J are shown with those of Examples 25 to 29 and Comparative Example 13.

Table 1-1 and 2 in which Comparative Example A is added

		Example											Comparative Example		
		1	2	3	4	5	6	7	8	9	10	11	1	2	A
Component (A)	SBR ^{*1} (part by mass)	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Component (B)	hydrogenated SBR ^{*2} (part by mass)	40	40	40	40	40	40	40	40	40	40	40	40	—	40
Component (C) resin providing tackiness (part by mass)	C5/C9 copolymer resin ^{*3}	40	—	—	—	—	—	—	—	—	—	—	—	—	—
	phenol resin A ^{*4}	—	40	—	—	—	—	—	—	—	—	—	—	—	—
	phenol resin B ^{*5}	—	—	40	—	—	—	—	—	—	—	—	—	—	—
	DOPD resin ^{*6}	—	—	—	40	—	—	—	—	—	—	—	—	—	—
	C5-based resin ^{*7}	—	—	—	—	40	—	—	—	—	—	—	—	—	—
	C9-based aromatic resin A ^{*8}	—	—	—	—	—	40	—	—	—	—	—	—	—	—
	C9-based aromatic resin B ^{*9}	—	—	—	—	—	—	40	—	—	—	—	—	—	—
	coumarone-indene resin A ^{*10}	—	—	—	—	—	—	—	40	—	—	—	—	—	—
	coumarone-indene resin B ^{*11}	—	—	—	—	—	—	—	—	40	—	—	—	—	—
	Aromatic oil ^{*12} (part by mass)	—	—	—	—	—	—	—	—	—	—	—	40	80	—
Carbon black A ^{*13} (part by mass)		80	80	80	80	80	80	80	80	80	80	80	80	80	80
Stearic acid (part by mass)		2	2	2	2	2	2	2	2	2	2	2	2	2	2
Zinc oxide (part by mass)		3	3	3	3	3	3	3	3	3	3	3	3	3	3
Antioxidant ^{*20} (part by mass)		1	1	1	1	1	1	1	1	1	1	1	1	1	1
Vulcanization accelerator A ^{*21} (part by mass)		0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Vulcanization accelerator B ^{*22} (part by mass)		1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sulfur (part by mass)		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Hysteresis loss		120	118	113	113	116	121	119	118	119	118	119	100	87	92
Dry gripping property		115	112	109	108	111	114	113	113	114	113	114	100	90	95
Wet gripping property		109	106	105	104	106	111	109	105	107	105	107	100	98	96

[Note]

*1: A styrene-butadiene copolymer having a weight-average molecular weight of 1.0×10^6 as expressed by the molecular weight of the corresponding polystyrene,

- a content of the bound styrene of 30% by mass and a content of the vinyl unit in the butadiene portion of 50% by mass.
- *2: A hydrogenated liquid styrene-butadiene copolymer having a weight-average molecular weight of 1.0×10^4 as expressed by the molecular weight of the corresponding polystyrene, a content of the bound styrene of 40% by mass and a fraction of hydrogenated double bond in the butadiene portion of 90%. The weight-average molecular weight is expressed as the molecular weight of the corresponding polystyrene.
 - *3: "STRUKTOL TS30"; manufactured by SCHILL & SEILACHER Company.
 - *4: "KORESIN"; manufactured by BASF Company.
 - *5: "HITANOL 1502"; a novolak type alkylphenol resin; manufactured by HITACHI KASEI KOGYO Co., Ltd.
 - *6: "ESCOREZ 8180"; a dicyclopentadiene-based resin; manufactured by EXXON CHEMICAL Company.
 - *7: "HI-REZ T500X"; manufactured by MITSUI KAGAKU Co., Ltd.
 - *8: "FTR0120"; manufactured by MITSUI KAGAKU Co., Ltd.
 - *9: "NEOPOLYMER 140"; manufactured by SHIN NIPPON SEKIYU KAGAKU Co., Ltd.
 - *10: "ESCURON V120"; manufactured by SHIN NITTETSU KAGAKU Co., Ltd.
 - *11: "ESCURON L-20"; manufactured by OUCHI SHINKO KAGAKU KOGYO Co., Ltd.
 - *18: "AROMACS #3"; manufactured by FUJI KOSAN Co., Ltd.
 - *19: The outer surface area in accordance with the CTAB adsorption method: 148 m^2/g ; 24M4 DBP absorption: 102 ml/100 g.
 - *20: N-1,3-Dimethylbutyl-N'-phenyl-p-phenylenediamine.
 - *21: 1,3-Diphenylguanidine.
 - *22: Dibenzothiazyl disulfide.

Table 4 in which Comparative Examples B to J are added

Example					Comparative Example										
	25	26	27	28	29	13	B	C	D	E	F	G	H	I	J
Petroleum resin (amount, part by mass)	40	40	40	40	40	—	—	40	40	40	40	40	40	40	40
	Aromatic oil (part by mass)					40	—	—	—	—	—	—	—	—	—
Petroleum resin	A ¹⁰	B ²⁵	C ³⁶	D ²⁷	E ²³	—	—	a	b	c	d	e	f	m	n
Softening point (°C)	145	110	128	125	165	—	—	—	—	—	—	—	—	—	—
Material monomer	C ₉	C ₉	C ₉	C ₉	C ₉	—	—	terpene phenol	terpene	terpene	C ₉	C ₉ and small amount of C ₉	C ₉	cyclo- penta- diene	C ₉
						—	—	—	—	—	maleic acid	maleic acid	—	—	—
Modifier	—	—	DCDP	phenol	maleic acid	—	—	—	—	—	—	—	—	—	—
Hysteresis loss	104	102	103	109	115	90	100	102	101	99	102	102	102	101	101
	104	103	106	107	110	91	100	98	97	96	100	101	98	101	102
Dry gripping property	102	103	103	105	103	98	100	104	104	106	98	97	104	102	98
Wet gripping property	102	103	103	105	103	98	100	104	104	106	98	97	104	102	98
Processability in production plants	○	○	○	○~△	○	○	○	○	○	○	△	△	○	○	○

A^{a5}: "NEOPOLYMER 140"B^{a5}: "W110"; manufactured by GRAY VALLEY CompanyC^{a5}: "NEOPOLYMER 130S"; manufactured by SHIN NIPPON SEKIYU KAGAKU Co., Ltd.D^{a5}: "NEOPOLYMER E-130"; manufactured by SHIN NIPPON SEKIYU KAGAKU Co., Ltd.E^{a5}: "NEOPOLYMER 160"; manufactured by SHIN NIPPON SEKIYU KAGAKU Co., Ltd.

4. I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: September 30, 2008

By: Seiichi Kato
Seiichi KATO